

中国的骨碎补科*

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DAVALLIACEAE OF CHINA

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Abstract The delimitation of the genera in Davalliaceae is discussed with the conclusion that only four genera remain, *Davallia*, *Davallodes*, *Gymnogrammitis*, and *Leucostegia*. The species formerly belonging to *Araiostegia* and *Humata* are incorporated in *Davallia*. In China only 3 genera occur, *Davallia* with 12 species, *Gymnogrammitis* with one species, and *Leucostegia* with one species.

Key words Davalliaceae; Classification; China

摘要 本文讨论了骨碎补科属的划分问题, 承认了骨碎补属、钻毛蕨属、雨蕨属和大膜盖蕨属。小膜盖蕨属和阴石蕨属的种类被并入到了骨碎补属。中国计有骨碎补科植物 3 属 14 种, 其中骨碎补属 12 种, 雨蕨属 1 种, 大膜盖蕨属 1 种。

关键词 骨碎补科; 分类; 中国

1 THE GENERA OF DAVALLIACEAE

For a detailed history of the generic delimitation, see Kato (1985). The family Davalliaceae was classified into eight genera by Copeland (1908, 1927). He recognised *Araiostegia* (including *Gymnogrammitis*), *Davallia*, *Davallodes*, *Humata*, *Leucostegia*, *Parasorus*, *Scyphularia*, and *Trogostolon*. The characters he used for his classification were leaf form and cutting, leaf texture, scales, pubescence, and form and size of the sori. *Araiostegia* was further revised by Ching (1959, without *Gymnogrammitis* which was made a family of its own by him) and Tagawa & Iwatsuki (1970). *Davallodes* was studied by Holttum (1972). Kato (1985) published "A systematic study of the genera of the fern family Davalliaceae". He recognized *Leucostegia*, *Davallodes*, *Gymnogrammitis*, *Davallia* (including the type species of *Humata* and a few other species of that genus), *Pachypleuria* (the rest of *Humata*), *Scyphularia*, and *Trogostolon*. In 1989 (Kato, 1989) he included *Scyphularia* in *Davallia* and suggested that *Parasorus* might also be included in that genus as a most specialized species. This was later done by Kramer (1990).

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2 CHARACTERS USED FOR DELIMITATION OF GENERA.

Scales *Leucostegia* is characterised by basifixed scales with broad bases by which they are attached to the rhizome. Moreover, it is the only genus with hairs on the rhizome or on the base of the scales. The attachment of the scales is so different from other members of Davalliaceae that *Leucostegia* can easily be recognised as a separate genus. Tryon & Lugar-don (1991) also conclude that *Leucostegia* is readily distinguished from the other genera of Davalliaceae by its "unusual rugulate perispore". In the other genera the rhizome scales have a quite different attachment. They can be peltate or basally attached with a cordate, overlapping base (sometimes called pseudo-peltate). Because the base is very thin and overlapping, this condition is easily overlooked. In his treatment of *Davallodes*, Holttum (1972) state that the scales are peltate, however, they are basifixed in two species. Although some authors regard basifixed scales as important for recognising genera (*Araiostegia* was recognised almost solely on this character), I came to the conclusion that the character, probably being primitive, occurs almost at random within the family. Sometimes, species that very similar to each other, and that probably are closely related, differ in this character. The scales are basifixed with greatly overlapping cordate base in the species of the former genus *Araiostegia*, in two species of *Davallodes* and in *Gymnogrammitis dareiforme*. *Araiostegia* was a genus with some of the characters of *Humata* or *Pachypleuria*, such as much divided leaves and only basally attached indusia, but with basifixed scales. *Gymnogrammitis* resembles *Davallia* very closely except that the sori have no indusia. Moreover, the rhizome is further specialised compared with *Davallia* in lacking a ventral vascular bundle (Kato, 1980). Also the spores are different in their large size and their surface structure (Tryon & Lugar-don, 1991). Therefore this genus is here maintained. Another diagnostic character that was used is the shape of the scales. In *Davallodes* (except *D. membranulosum*, which I include here in *Davallia*), and in the formerly recognised genera *Parasorus*, *Scyphularia* and *Trogostolon*, they are acicular. This means that, from a round base, the scales abruptly taper into a very narrow, threadlike, distal part that is mostly outwards curved above the appressed base. Kato (1985) explained that acicular and non-acicular scales are not different morphologically (nor, according to him, taxonomically). I agree to some extent with Kato. All species of *Davallodes* possess acicular (or nearly acicular) scales, but acicular scales are not unique to this genus. In *Davallia*, the scales are flat and nearly acicular in some species; this condition may occur together with normal, gradually tapering scales as in *Davallia denticulata*. Acicular scales also occur in the species of the former genera *Scyphularia* and *Parasorus*. In my opinion, they together form the section *Scyphularia*. The only species of *Davallia* outside *Scyphularia* with acicular scales is *Davallia falcinella* (formerly *Trogostolon falcinella*). Another type of scales, much resembling the gradually tapering scales, occurs in *Davallia solida*, and together with nearly acicular scales, in *D. trichomanoides*. These scales

are evenly narrowed towards the apex above the much broader base. They form a transition between acicular and evenly narrowed scales. The occurrence of apical and marginal multicellular hairs on the scales is also often considered an important character, but no correlation with other characters is found.

Indusia The indusia can be reniform, attached only at the narrow, cordate base or attached at a broad base and hardly or not at all at the sides, attached at the base and only part of the sides, or attached the base and along the sides (i. e. pouch shaped.) It is clear that the different conditions are transitional and difficult to use for separating genera. In *Davallodes*, all conditions occur, while the former genus *Humata* was mainly characterised by having only basally attached indusia.

Leaf shape and hairiness and insertion of pinnules The incision of the leaves is very diverse. It varies from an entire leaf to a decompound leaf with uni-veined ultimate segments. In one species, *Davallia repens*, both undivided and compound leaves occur, infertile as well as in sterile leaves. In the small group that forms the section *Scyphularia* undivided and imparipinnate leaves occur together with acicular scales. Compound leaves are generally deltoid and broadest towards the base, in *Davallodes*, they are elongate and not broader, sometimes even narrowed, towards the base, a character that also occurs in *Davallia membranulosa* and *D. assamica*. The pinnules in Davalliaceae can be anadromous, i. e. the apical pinnule of at least the lower pinnae is inserted nearer to the rhachis than the basal pinnule; the alternative condition is termed catadromous. In *Davallodes*, the pinnules are essentially catadromous, whilst they are anadromous in all the other taxa except *Davallia membranulosa* where they are more or less opposite (anadromous to catadromous). Kato (1985) and Nooteboom (1992) included this species in *Davallodes*. *Davallia membranulosa* also possesses hairy leaves and axes, as do all the species of *Davallodes*. But this character occurs in *Davallia* as well. The scales of *Davallia membranulosa* are not acicular. Therefore I include this species in *Davallia*. It is probably closest related to *Davallia assamica*.

Aerophores Sen, Sen & Holttum (1972) describe aerophores in two continuous pale lines on the petiole for *Davallia* and *Humata* and not for *Araiostegia* and *Davallodes*. As they studied only a few species, and this character is obscure in herbarium material, I refrain from evaluating it. Kramer (1990) mentions these aerophores in the description of the family.

Position of sorus relative to venation Kato (1985) made an extensive study of this character. The sori are strictly terminal in *Leucostegia*, while they are variously arranged in the other genera (facing midveins either at the bending point or at the forking point of veins). In the majority of the species they are placed at the forking point of veins, but the character state may vary within one collection. The character appears not to be very constant, and not useful for separating genera.

Chromosomes In *Leucostegia*, $x=41$, the chromosome counts indicate that *L. imm-*

ersa in India and Taiwan is diploid (Tryon and Lugardon 1991); in *Gymnogrammitis*, $x=36$ the count from a plant in Dali, Yunnan also indicates diploidy (Kato *et al.*, 1992); in the other genera, $x=40$, in *Davallia repens* from Ceylon, triploidy and apogamy is reported (Manton & Sledge, 1954).

Spores The spores are ellipsoidal with monolete aperture. The exospore is colliculate-verrucate, discretely verrucate, to fused verrucate to porous (the verrucae fused to the extent that the surface appears porous). All transitions occur between the different types, but generally the type is constant for a species or group of species. In *Leucostegia*, the spores are fused-verrucate, coarse in *L. immersa* and fine in *L. pallida*. The perispore is unusually rugulate unlike all other Davalliaceae. In *Gymnogrammitis*, the exospore is nearly plain, the surface papillate with globules and long rods. In these characters the spore is different from all other Davalliaceae spores. In *Davallodes* the spores are rather similar, from low to prominent verrucate-colliculate. This type of spore also occurs in *Davallia* and, together with other characters, points to the close relationship between the two genera. In the former genus *Araiostegia*, the perispore was described as granulate, contrary to the generally smooth perispore of *Davallia*. However, this character occurs only in one species, *Davallia (Araiostegia) clarkei*. The species of the former genus *Araiostegia* vary in the ornamentation of the exospore in the same way as the species of *Davallia*. Porous spores, which are rare in *Davallia*, do not occur in this group. Because closely related species generally possess the same kind of spores, I doubt whether this group is monophyletic. The size of the spores of *D. repens* varies between 27.33 and 46.67 μ m. As there is one apogamous triploid reported, and the size varies throughout the area of distribution, I suppose that hybridising resulting in triploidy and possibly polyploidy be the cause of the extremely high variability in *D. repens*. Many species possess colliculate-verrucate spores, that are rather constant for a species although transitions maybe found within one collection with discrete verrucate and discrete to fused verrucate. There is, in this large group, no correlation with other characters.

3 TAXONOMIC TREATMENT

Key to the genera

1. Lamina compound. Scales basifixed along broad base, roots borne on all sides of rhizome, sori terminal at the vein endings. 2. *Leucostegia*
1. Lamina compound or not. Scales peltate, or basifixed with cordate base and much overlapping lobes, roots restricted to the ventral side of lateral buds, sori facing midveins at the forking point of veins, or facing midveins at the bending point of a vein. 2
2. Lamina compound. Sori exindusiate, extra axillary lateral buds intermediate between two succeeding phyllopodia. 3. *Gymnogrammitis*
2. Lamina compound or not. Sori indusiate, extra axillary lateral buds lateral to the phyllopodia, or lower lateral and slightly anterior. 1. *Davallia*

3.1 Davallia

Davallia Sm. in Mem Accad. Sci Turin **5**:414. 1793; Copel., Gen. Fil. 87. 1947; Tard.-Blot & C. Chr. in Leecomte, Fl. Gen. Indo-Chine **7**: 103. 1939; Ching in Fl. Reip. Pop. Sin. **2**: 297. 1959; Holttum, Rev. Fl. Malaya 2nd ed. 354. 1966; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 271. 1975; Noot. in Blumea **39**:155. 1994. (Type: *D. canariensis* (L.) Sm)

Wibelia Bernh (non Fee 1852) in J. Bot (Schrader) **1800**:122, f. 2. t. 1. 1801. — *Davallia* sect. *Wibelia* Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. **13**:566. 1985. (Type: *W. elata* Bernh.)

Humata Cav., Descr. Pl. 272. 1802; Tard.-Blot & C. Chr. in Lecomte, Fl. Indo-Chine **7**:108. 1939; Copel., Gen. Fil. 88. 1947; Holttum, Rev. Fl. Malaya 2nd ed. 364. 1955; Ching in Fl. Reip. Pop. Sin. **2**: 306. 1959; Tagawa, Col. Illustr. Jap. Pterid. 67. 1959; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 274. 1975. (Type: *H. ophioglossa* Cav.)

Araiostegia Copel. in Philipp. J. Sci. **34**:240, t. 1, 2. 1927; Holttum, Rev. Fl. Malaya 2nd ed. 364. 1955; Ching in Fl. Reip. Pop. Sin. **2**: 285. 1959; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. **13**:564. 1985; Noot. in Blumea **37**:165. 1992. (Type: *A. hymenophylloides* (Blume) Copel.)

Trogostolon Copel. in Philipp. J. Sci. **34**:251, t. 4. 1927; Gen. Fil. 87. 1947; Fern. Fl. Pilipp. 170. 1958; Ching in Fl. Reip. Pop. Sin **2**: 283. 1959; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. **13**:568. 1985. (Type: *T. falcinellus* (K. Presl) Copel.)

Paradavallodes Ching in Acta Phytotax. Sin. **11**:18. 1966. (Type: *P. multidentata* (Hook.) Ching.)

Roots restricted to the ventral side of lateral buds. Scales of rhizome peltate or basifixed with cordate base and greatly overlapping lobes, variously shaped; distinctly acicular, or flat and nearly acicular, narrowed evenly towards the apex, or narrowed abruptly from a broad base, or broad, ovate to oblong-subdeltoid with round to acute apex. Petioles usually well developed, in two ranks on the dorsal side of the rhizome; adaxial face sulcate, the groove usually raised in the middle; small species sometimes with sessile leaves; petiole occasionally persistently scaly. Lamina simple, imparipinnate, pinnate + pinnatifid, bipinnate + bipinnatifid, or tripinnate + tripinnatifid; if compound deltoid and broadest towards base or rarely elongate, glabrous or rarely bearing multicellular hairs, anadromous or rarely isodromous or catadromous and then the scales evenly narrowed towards the apex; lamina dimorphic or monomorphic, in dimorphic species with reduced leaf tissue and/or more dissected. Vein endings on sterile segments reaching the margin or not. False veins present in several species. Rhachis winged and therefore seemingly grooved adaxially but convex between the wings. In the dry state (or herbarium specimens), it is difficult to see whether the rhachis itself is grooved or flat. Sori typically separate but in *D. undulata* connate and elongate a-

long leaf margins; sori near the margin, facing midveins at the forking point of veins or at the bending point of a vein.

Distribution From India through continental SE Asia to China, Korea, and Japan; Malesia; the Pacific to Samoa and New Zealand; NE Australia; the islands in the Indian Ocean; Africa; one species in NW Africa, the Canary Islands, and SW Europe. The genus *Davallodes* does not occur in China. The recent centre of distribution of the genus (and of the family) is clearly Malesia with 23 of the total 34 species and 9 endemic species. Malesia and the Pacific together possess 16 endemic species. The island of Sumatra contains 16 species, Borneo 14, the Philippines 13, the Moluccas 15, New Guinea 14, but the Pacific also has a large number of species, viz. 14, of which three (one in New Zealand) are endemic. The species endemic to Asia north of the Isthmus of Kra in S Thailand number only 7.

Key to the species of *Davallia*

1. Lamina elongate, often narrowing towards base 2
1. Lamina deltoid and broadest towards base 5
2. Stipes bearing hairs and or scales when young **6. *Davallia membranulosa***
2. Stipes glabrous or with few scales 3
3. Lamina simple, one pectinate or pinnatifid leaf, rhizome white waxy under the scales, scales with pale border from base to apex, bearing multiseptate hairs at least when young **8. *Davallia pectinata***
3. Lamina compound, or pinnate towards base, rhizome not white waxy, scales without pale border, not bearing multiseptate hairs 4
4. Scales broad, ovate to oblong-subdeltoid with round to acute apex, lacking marginal setae or teeth, or those rare, basifixed with cordate base and much overlapping lobes, 2 to 5 mm long, lamina tripinnate or quadripinnate, indusium scale-like, attached at the narrow, cordate base only **9. *Davallia pulchra***
4. Scales narrowed evenly towards the apex, toothed, peltate, 8 to 10 mm long, lamina pinnate with pinnatifid to pinnatifid pinnae, indusium attached at the broad base and hardly or not at the sides **1. *Davallia assamica***
5. Indusium also attached along the sides, pouch-shaped, oblong 6
5. Indusium scale-like, attached at the narrow, cordate base only, at the base and only part of the sides, or attached at the broad base and hardly or not at the sides, reniform, semicircular, or more or less triangular to rhomboid 9
6. Sori frequently single on a segment **12. *Davallia trichomanoides***
6. Sori borne several on a segment 7
7. Scales bearing multiseptate hairs at least when young **11. *Davallia solida***
7. Scales not bearing multiseptate hairs 8
8. Scales basifixed with cordate base and much overlapping lobes, false veins not present **4. *Davallia divaricata***
8. Scales peltate, false veins present **3. *Davallia denticulata***
9. Leaf axes and rhachises hairy **7. *Davallia multidentata***
9. Leaf axes glabrous 10

10. Scales broad, ovate to oblong-subdeltoid with round to acute apex 9. *Davallia pulchra*
 10. Scales narrowed evenly towards the apex 11
 11. Scales basifixed with cordate base and much overlapping lobes, lamina compound, lowest pinnule inserted at very base of pinna rhachis 2. *Davallia clarkei*
 11. Scales peltate, if lamina compound lowest pinnule not inserted at very base of pinna rhachis 12
 12. Rhizome 0.5~3 mm diam., white waxy under the scales, lamina from simple, trifoliate to pectinate or compound 10. *Davallia repens*
 12. Rhizome 3~6 mm diam., not white waxy, lamina compound 5. *Davallia griffithiana*

Davallia assamica Baker in Hook. & Baker, Syn. Fil. 452. 1868; Noot. in Blumea **39**: 174. 1994. — *Humata assamica* C. Chr. in Contr. U. S. Natl. Herb. **26**: 293. 1931; Ching, Icon. Fil. Sin. **3**. pl. 105. 1935; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 288, f. 69; 1~2. 1983; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 156. 1993. (Type: Thomson, Bedd. t. 94 (Assam)).

Distribution Continental Asia; India (Manipur, Naga Hills), Bhutan, Burma, China (S. Xizang, Yunnan).

Ecology Altitude 900~2300 m.

Davallia clarkei Baker in Hook. & Baker, Syn. Fil. 91. 1874; Noot. in Blumea **39**: 176. 1994. — *Leucostegia clarkei* C. Chr. in Contr. U. S. Natl. Herb. **26**: 294. 1931. — *Araiostegia hookeri* Ching, Fl. Reip. Pop. Sin. **2**: 291. 1959; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 284, f. 68; 1~3. 1983; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 155. 1993. (Type: Hook. f. & Thomson 315 (BM, iso; K), India, Sirmur.)

Davallia perdurans Christ in Bull. Herb. Boissier **6**: 970. 1898. — *Leucostegia perdurans* C. Chr. in Contr. U. S. Natl. Herb. **26**: 294. 1931. — *Araiostegia perdurans* Copel. in Univ. Calif. Publ. Bot. **12**: 397. 1931; Ching, Fl. Reip. Pop. Sin. **2**: 294. 1959; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 270, pl. 95. 1975; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 285, f. 68; 4~6. 1983; K. H. Shing in Icon. Corm. Sin. **1**: 143, f. 285. 1972; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 155. 1993; J. F. Cheng, Fl. Jiangxi **1**: 95, f. 79. 1993; C. F. Zhang, Fl. Zhejiang **1**: 293, f. 1~303. 1993. (Type: Henry 10086 (BAS, iso; BM, A, K), China, Yunnan.)

Davallia parvipinnula Hayata, Mat. Fl. Formosa 431. 1911. — *Leucostegia parvipinnula* Hayata, Icon. Pl. Formos. **4**. 205, f. 139. 1914. — *Araiostegia parvipinnula* Ching, Fl. Reip. Pop. Sin. **2**: 292. 1959; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. **1**: 186, f. 74. 1994. (Type: Kawakami & Mori 1823 (TI), Taiwan, Morrison.)

Davallia subalpina Hayata, Mat. Fl. Formosa. 432. 1911. (Type: Nakahara Nov. 1906 (TI), Taiwan, Arisan.)

Davallia clarkei var. *faberiana* C. Chr. in Acta Horti Gothob. **1**: 73. 1924. — *Leucostegia clarkei* var. *faberiana* C. Chr. in Contr. U. S. Natl. Herb. **26**: 194. 1931. —

Leucostegia faberiana Ching in C. Chr., Ind. Fil. Suppl. 3: 120. 1934. — *Araiostegia faberiana* Ching, Fl. Reip. Pop. Sin. 2: 293. 1959; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 286. 1983; Tagawa & Iwatsuki in Acta Phytotax. Geobot. 24: 180. 1970; Fl. Thailand 3 (2): 152, f. 11: 2. 1985. (Type: Faber 1089 (W, iso: K, P), China, Sichuan, Mt. Emei.)

Distribution NW India, Bhutan, Nepal, Burma, N Thailand, China (Zhejiang, Jiangxi, Sichuan, Guizhou, Fujian, Hongkong, Taiwan, Yunnan, Xizang).

Ecology Epiphytic or epilithic in evergreen forest, sometimes in open places. Altitude 1200~4000 m.

Davallia denticulata Mett. ex Kuhn, Filic. Decken. 27. 1867; Ching, Fl. Reip. Pop. Sin. 2: 298. 1959; Ching *et al.* in Chun *et al.*, Fl. Hainan. 1: 60. 1964; Holttum, Rev. Fl. Malaya 2: 2nd ed. 359. 1966; Tagawa & Iwatsuki, Thailand 3(2): 160. 1985; Noot. in Blumea 39: 178. 1994 — *Adiantum denticulatum* (Pluk., Phytogr. 3: 151, t. 180, f. 4. 1692); N. L. Burm., Fl. Indica. 236. 1768. (Type: Pryon (non vidi), Java.)

Davallia brevisora Ching, Fl. Reip. Pop. Sin. 2: 377. 1959. (Type: Feng, K. M. 13986 (PE, iso: KUN), China, Yunnan, Malipo, Dec. 20th 1947 (Ching cites nr. 13586, a printing error of nr. 13986.)

In China only var. *denticulata*.

Distribution Generally common. Africa and Indian Ocean: Madeira, Tropical and South Africa, Madagascar, Comores, Seychelles, Christmas Island. Sri Lanka, India (Assam and Andaman and Nicobar Is.), Thailand, Burma, Indo-China (Laos, Cambodia, Vietnam). China (Hainan). Malesia throughout. Australia: Queensland. Pacific: Samoa, Society Is. (Tahiti).

Ecology Epiphyte on many different species of trees and in different types of forest incl. mangrove forest or on solitary trees, epilithic on granite, limestone, or sandstone, terrestrial on different kinds of soil, f. i. on sand in edge of Kerangas. Altitude 0~2200 m.

Note *Davallia brevisora* Ching is a form with the false veins absent or inconspicuous.

Davallia divaricata Blume, Enum. Pl. Javae. 237. 1828; Hook., Syn. Fil. 96. 1868; Holttum, Rev. Fl. Malaya 2nd ed. 362. 1966; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 272. 1975; Hoshiz. in Bailey 21: 10, t. 4. 1981; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 161. 1985; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot 14: 229. 1989; Noot. in Blumea 39: 180. 1994. — *Araiostegia divaricata* Kato in Acta Phytotax. Geobot. 26: 158. 1975. (Type: Blume LB 908333-153 (L, iso: K), Java, G. Burangan.)

Davallia formosana Hayata, Mat. Fl. Formosa. 430. 1911; Ching, Fl. Reip. Pop. Sin. 2: 301. 1959; Ching *et al.* in Chun *et al.*, Fl. Hainan. 1: 60, f. 27. 1964; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. 1: 188. 1994. (Type: Nakahara San. Febr. 1907 (TI), Taiwan, Taichu.)

Davallia orientalis C. Chr. apud Wu *et al.* in Bull. Dept. Biol. Sun Yatsen Univ. **3**: 104, t. 43. 1932; C. Chr. in Bull. Dept. Biol. Sun Yatsen Univ. **6**: 9. 1933; Ching, Icon. Fil. Sin. **3**: pl. 104. 1935; L. K. Lin, Fl. Fujian. **1**: 29, f. 55. 1982; — *D. divaricata* var. *orientalis* Tard-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine **7**: 107. 1939. (Type: Sin 3698 (KYO, SYS), China, Guangxi, Jinxiu (Dayaoshan))

Davallia austro-sinica Ching, Fl. Reip. Pop. Sin. **2**: 376. 1959 (Type: Lau, S. K. 32 (PE), Guangdong)

Davallia amabilis Ching, Fl. Reip. Pop. Sin. **2**: 376. 1959. (Type: Tsai, Ke-hwa 771 (PE), Yunnan, Hekou, Majie)

In China only var. *divaricata*.

Distribution Common from India to China (Yunnan, Fujian, Guangxi, Guangdong, Taiwan, Hainan) southwards through SE Asia. Malesia throughout. Pacific: Solomon Is.

Ecology Generally epiphytic, sometimes epilithic on limestone, or bedrock not specified; rarely terrestrial. Mostly in dense forest, sometimes on dry places. Altitude 0~1850 m.

Note In TI, I had the occasion to study the type of *Davallia formosana* Hayata. It fits perfectly well in the variability of *D. divaricata*.

Davallia griffithiana Hook., Sp. Fil. 168, t. 49B. 1845. — *Leucostegia griffithiana* J. Sm., Hist. Fil. 84. 1875. — *Humata griffithiana* C. Chr. in Contr. U. S. Natl. Herb. **26**: 293. 1931; Ching, Fl. Reip. Pop. Sin. **2**: 312. 1959; Ching & Y. X. Lin in Acta Phytotax. Sin. **22** (5): 400. 1984; X. Cheng in W. T. Wang *et al.*, Vasc. Pl. Hengduan Mount. **1**: 156. 1993; W. C. Shieh *et al.*, Fl. Taiwan 2nd. ed. **1**: 192, pl. 7. 1994. (Type: Griffith 910 (K, iso: L), India-China (Xizang) border, Mishmee.)

Humata tyermanii Moore in Gard. Chron. **1871**: 870, t. 178. 1871; Hand-Mazz., Symb. Sin. **4**: 29. 1929; Wu in Bull. Dept. Biol. Sun Yatsen Univ. **3**: 102, pl. 42. 1932; Tard-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine **7**: 112. 1939; Ching, Fl. Reip. Pop. Sin. **2**: 310. 1959; K. H. Shing in Icon. Corm. Sin. **1**: 145, f. 290. 1972; Jiangsu Zhiwu Zhi (Fl. Jiangsu) **1**: 26, f. 29. 1977; L. K. Lin, Fl. Fujian. **1**: 61, f. 57. 1982; R. J. Chen in Anhui Zhiwu Zhi (Fl. Anhui) **1**: 179, f. 184. 1985; J. F. Cheng, Fl. Jiangxi **1**: 97, f. 80. 1993; C. F. Zhang, Fl. Zhejiang. **1**: 295, 1993. — *Davallia tyermanii* Moore in Gard. Chron. **1871**: 871 (syn.). 1871. (Type: Herb. Moore (K))

Davallia platylepis Baker in Kew Bull. **1898**: 229. 1898. — *Humata platylepis* Ching, Fl. Reip. Pop. Sin. **2**: 311. 1959. (Type: Henry 10082 (K), China, Yunnan, Mengzi.)

Davallia henryana Baker in Kew Bull. **1906**: 8. 1906. — *Humata henryana* Ching, Fl. Reip. Pop. Sin. **2**: 312. 1959; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 288, f. 69:5~6. 1983. (Type: Henry 10082 A (K), China, Yunnan, Mengzi.)

Distribution India (Manipur, Assam), Bhutan, Burma (Kentung), Vietnam

(Tonkin), Laos, China (Zhejiang, Jiangxi, Hunan, Sichuan, Guizhou, Fujian, Taiwan, Guangxi, Guangdong, Yunnan, Xizang), Japan (Okinawa).

Ecology Altitude 500~2200 m.

Note Comparing the types of all the synonyms, which are all in K, convinced me that they all belong to the same characteristic species.

Davallia membranulosa [Wall., Cat. 255. 1828. nomen]; Hook., Sp. Fil. 159. 1845. — *Davallodes membranulosum* Copel. in Philipp. J. Sci. **34**:245. 1927; Tard-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine **7**: 115. 1939; Ching, Fl. Reip. Pop. Sin. **2**:282, pl. 21:7~8. 1959; Tagawa & Iwatsuki, Fl. Thailand **3** (2): 156. 1985; Noot. in Blumea **37**: 182. 1992. — *Paradavallodes membranulosum* Ching in Acta Phytotax. Sin. **11**:20. 1966. — *Araiostegia membranulosa* Holttum in Kew Bull. **27**: 230. 1972. (Type: Wallich 255 (K, iso:P), Nepal.)

Davallodes chingiae Ching, Fl. Reip. Pop. Sin. **2**: 375. 1959. — *Paradavallodes chingiae* Ching in Acta Phytotax. Sin. **11**:20. 1966 (Type: K. M. Feng 13127 (PE, iso: KUN), China, Yunnan, Malipo.)

Distribution Continental Asia: India (Darjeeling, Kumaon, Saharanpur), Sikkim, Nepal, Burma (Kengtung state), N. Thailand, Vietnam (Tonkin, Chapa), China (Yunnan, Sichuan).

Ecology Epilithic or epiphytic in forest. Altitude 600~2600 m.

Note For the generic position see the discussion at the beginning. Although Ching recognised two species, careful examination of the types could not but lead to the conclusion that there is only one, easily recognisable, species.

Davallia multidentata Hook, Syn. Fil. 91. 1868; Clarke, Rev. Ferns N. India 442. 1880; Noot. in Blumea **39**:188. 1994. — [*Aspidium multidentatum* Wall., Cat. nr. 346. 1828, nomen.] — *Leucostegia multidentata* Bedd., Ferns Brit. India. t. 313. 1869. — *Araiostegia multidentata* Copel. in Philipp. J. Sci. **34**: 241. 1927. Ching, Fl. Reip. Pop. Sin. **2**:295. 1959; Noot. in Blumea **37**:173. 1992 — *Paradavallodes multidentatum* Ching in Acta Phytotax. Sin. **11**:20. 1966; Ching & Y. X. Lin in Acta Phytotax. Sin. **22**(5):400. 1984. (Type: Wallich 346 (K, iso: BM), Himalayas.)

Paradavallodes kansuense Ching in Acta Phytotax. Sin. **11**: 20. 1966. Ching & Y. B. Hsu in Fl. Tsinling. **2**: 51, pl. 12: 5~8 1974. (Type: Hsu, Y. B. 1726 (PE), China, Gansu, Wenxian.)

Distribution Continental Asia: India (Darjeeling, Manipur, Assam), Sikkim, Nepal, China (Sichuan, Gansu Yunnan, Xizang).

Ecology Altitude 1200~2100 m

Note In my paper "Notes on Davalliaceae I" (Blumea **37** (1992): 175), I reduced *Paradavallodes kansuense* Ching to *Araiostegia pulchra* on basis of the description. Later, however, I could study the type in PE and came to the conclusion that it belongs here.

Davallia pectinata Sm. in Mém. Accad. Sci. Turin **5**: 415. 1793. — *Humata pectinata* Desv., Prod. Fam. Foug. 323. 1827; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 276. 1975; Tagawa & Iwatsuki, Fl. Thailand **3** (2): 176. 1985; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. **1**: 192, pl. 78, photo 50. 1994. — *Pachypleuria pectinata* K. Presl in Epim. Bot. **98**. 1849; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. **14**: 231. 1989. (Type: D. Hurloch 1786 (non vidi), India Orientalis.)

Distribution India (S. Andaman, and Nicobar Is.), China (Taiwan, Orchid Is.), Cambodia, Thailand, Malesia, Australia (N. Queensland), Pacific Is. (Trud Is., Solomons, New Hebrides, New Caledonia, Samoa, Carolines, Society Islands).

Ecology Epiphytic, epilithic, or sometimes terrestrial, on sand, lava, or limestone.

Davallia pulchra D. Don, Prodr. Fl. Nepal. **11**. 1825; C. B. Clarke, Rev. Ferns N. India **444**. 1880; Baker in Kew Bull. **1895**: 53. 1895; Noot. in Blumea **39**: 191. 1994. — *Araiostegia pulchra* Copel. in Philipp. J. Sci. **34**: 241. 1927; Ching, Fl. Reip. Pop. Sin. **2**: 1959, pl. 21: 9~10. 1959; Tagawa & Iwatsuki in Acta phytotax. Geobot. **24**: 180. 1970; Fl. Thailand **3**(2): 154. 1985; K. H. Shing in Icon. Corm. Sin. **1**: 142, f. 284. 1972; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 155. 1993; Noot. in Blumea **37**: 173. 1992. (Type: Wallich 259(K, iso: BM, L, P), Nepal.)

Davallia pseudocystopteris Kunze in Bot. Zeitung (Berlin) **68**. 1850. — *Araiostegia pseudocystopteris* Copel. in Philipp. J. Sci. **34**: 241. 1927; Ching, Fl. Reip. Pop. Sin. **2**: 287. 1959; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 284, f. 67: 1~2. 1983; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 155. 1993; Tagawa & Iwatsuki in Acta Phytotax. Geobot. **24**: 181. 1970; Fl. Thailand **3** (2): 155, f. 11: 4. 1985. (Type: Colonel Dyas (K), India, Dalhousie (SW Himalayas))

Davallia pulchra var. *delavayi* Bedd. ex C. B. Clarke & Baker in J. Linn. Soc. Bot. **24**: 410. 1888. — *Leucostegia delavayi* Ching in C. Chr., Ind. Fil. Suppl. **3**: 120. 1934. — *Araiostegia delavayi* Ching, Fl. Reip. Pop. Sin. **2**: 289. 1959; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. **1**: 284. 1983; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. **1**: 155. 1993. (Type: Delavay (K, iso: BO), China, Yunnan, Binchuan, Jizushan.)

Davallia yunnanensis Christ in Bull. Herb. Boissier **6**: 970. 1898. — *Davallia rigidula* Baker in Kew Bull. **1906**: 8 (illegit. name). 1906. — *Araiostegia yunnanensis* Copel. in Philipp. J. Sci. **34**: 241. 1927; Ching, Fl. Reipubl. Popul. Sin. **2**: 290. 1959. *Leucostegia yunnanensis* C. Chr., Ind. Fil. Suppl. **3**: 121. 1934; Tard.-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine **7**: 113. 1939. — *Humata yunnanensis* Ching in Bull. Fan Mém. Inst. Biol. sér. **I**, **1**: 296. 1949. (Type: Henry 10333 A (K), China, Yunnan, Mengzi.)

Davallia beddomei Hope in J. Bomb. Nat. Hist. Soc. **12**: 527, t. 1. 1899. — *Araiostegia beddomei* Ching, Fl. Reip. Pop. Sin. **2**: 288. 1959; Ching & S. K. Wu in C.

Y. Wu, Fl. Xizang. 1: 282, f. 67: 3~4. 1983; X. Cheng in W. T. Wang *et al.*, Vasc. Pl. Hengduan Mount. 1: 156. 1993. (Lectotype; Bliss ex Hope herb. (BM, iso; P), India, Simla, Mt. Kamalhari.)

Davallia athamantica Christ in Bull. Soc. Bot. France 52 Mém. 1: 65. 1905. — *Araiostegia athamantica* Copel. in Philipp. J. Sci. 34: 241. 1927. (Lectotype; Delavay 1155 (K, iso; P), China, Yunnan.) — *Araiostegia imbricata* Ching, Fl. Reip. Pop. Sin. 2: 377. 1959; Tagawa & Iwatsuki in Acta Phytotax. Geobot. 24: 180. 1970; Fl. Thailand 3 (2): 152, f. 11: 3. 1985. (Type; C. W. Wang 78372 (KUN), China, Yunnan, Jinghong.)

Distribution Common from Sri Lanka through India, Nepal, Sikkim, Bhutan, SW China (Sichuan, Guizhou, Yunnan, Xizang), Burma, N Thailand, Laos, Vietnam.

Ecology Epiphytic and epilithic on granite and limestone. Altitude 450~3500 m.

Note Although the species is rather variable, especially because in different habitats the size may differ greatly, it is always recognisable by the broad, appressed, usually crisped rhizome scales.

Davallia repens Kuhn in Ann. Mus. Bot. Lugd.-Bat. 4: 286. 1869; Filic. Decken. 27. 1867; Noot. in Blumea 39: 192, pl. 6~9. 1994. — *Adiantum repens* L. fil., Suppl. Pl. 446. 1781. — *Humata repens* Diels in Engl. & Plantl. Nat. Pflanzenfam. 1, 4: 209. 1899; Ogata, Icon. Fil. Jap. 1: pl. 29. 1928; C. Chr. in Contr. U. S. Nat. Herb. 26: 293. 1931; Wu *et al.* in Bull. Dept. Biol. Sun Yatsen Univ. 3: 100, pl. 41. 1932; Tard-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine 7: 111. 1939; H. Ito, Fil. Jap. Ill. pl. 28. 1944; Tagawa, Col. Ill. Jap. Pterid. 67, 218, pl. 21, f. 122. 1959; Ching, Fl. Reip. Pop. Sin. 2: 308, pl. 27: 1~5. 1959; Ching *et al.* in Chun *et al.*, Fl. Hainan. 1: 62, f. 28. 1964; Holttum, Rev. Fl. Malaya 2nd ed. 371, f. 216. 1966; Sen & Holttum in Kew Bull. 27: 228, f. 8. 1972; K. H. Shing in Icon. Corm. Sin. 1: 145, f. 289. 1972; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 276. 1975; L. K. Lin in Fl. Fujian. 1: 61, f. 56. 1982; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 166. 1985; Basu & Giri in J. Econ. Tax. Bot. 15: 115, t. 3: k~o. 1991; J. F. Cheng, Fl. Jiangxi. 1: 96, f. 79. 1993; C. F. Zhang, Fl. Zhejiang. 1: 295, f. 1~305. 1993. (Type; Sonnerat par Thouin (Commerson) 74 (P, iso; L), Mascareignes, Ile de France.)

Humata trifoliata Cav., Descr. Pl. 273. 1802; C. Chr. in Dansk Bot. Ark. 39: 26. 1937; Copel., Fl. Philipp. 177. 1958; Ching, Fl. Reip. Pop. Sin. 2: 309, pl. 27: 6~9. 1959; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 276, pl. 97. 1975 — *Pachypleuria trifoliata* K. Presl, Epim. Bot. 98. 1851. (Type; Nee (BM), Pacific, Mariana Islands.)

Davallia vestita Blume, Enum. Pl. Javae 233. 1828. — *Humata vestita* Moore, Ind. Fil. XC I. 1857; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 278. 1975; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 165. 1985. (Type; Blume (L 908275. 969), Java, G. Burangan.)

Davallia subalpina Hayata in J. Coll. Sci. Univ. Tokyo. **30**: 432. 1911. (Type: ?)

Davallia chrysanthemifolia Hayata, Icon. Pl. Formos. **5**: 265, f. 97. 1915. — *Humata chrysanthemifolia* Hayata, Gen. Ind. Fl. Formos. 109. 1916; C. Chr., Ind. Fil. Suppl. **2**: 19. 1917; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 274. 1975; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. **1**: 190. 1994. (Type: Takeo Ito 27 (TI), Taiwan, Mt. Arisan.)

Humata macrostegia Tagawa in Acta Phytotax. Geobot. **6**: 231. 1937; Ching. Fl. Reip. Pop. Sin. **2**: 310. 1959. (Type: Fukuyama 4752 (KYO), Taiwan, Kaohsiung.)

Distribution Africa: Cameroun. Indian Ocean: Comores and Madagascar, Seychelles, Mascareignes, Reunion and Mauritius, Kerguelen, Bourbon Is.. Sri Lanka and throughout India, Sikkim, S. Burma, China (Jiangxi, Sichuan, Guizhou, Fujian, Guangdong incl. Hongkong, Guangxi, Yunnan, Hainan, Taiwan), Japan (Honshu, Shikoku, Kyushu, Yakushima, Okinawa), Thailand, Cambodia, Vietnam, Malesia throughout. Australia: Queensland. Pacific: Common in Admiralty Is., Lashed Is., Solomon Is., New Hebrides, New Caledonia, Fiji, and Samoa.

Ecology Very diverse. Low or high epiphytic, epilithic on various kinds of rocks, sometimes terrestrial. In very wet to dry sunny places. Altitude 0~3420 m.

Note This is very variable species. On the base of herbarium specimens, it is not possible to subdivide it, which results in a very unsatisfying and extremely variable species. The species is probably subject to hybridising and introduction of genes from several related species. From Sri Lanka, a apogamous triploid was described by Manton & Sledge (1954). In areas where no related species are found, such as in mainland China, in the islands in Indian Ocean, and in Africa, only the pure form with pinnate to pinnatifid leaves occurs. In New Guinea, the pure form is very rare. I have tried to subdivide the species in varieties. Although some forms are rather constant even over large areas, there are always many intermediate forms found between all the rather constant ones, having identification impossible. All the forms have in common the rhizome incl. the scales, the indusia, and the spores. However, there is a great variability in size of the spores, pointing to different ploidy levels. The pure form is generally found at lower altitudes, the other forms at higher ones, f. i., in W. Java, the pure form occurs from 450 to 1100 m, the other forms from 1400 to 2500 m. In Malaya, this is from 150 to 1600 and from 1400 to 2000 m. In Borneo, however, the pure form is found from 0 to 2500 m, the other forms from 100 to 3150 m. In the Philippines, this is from 500 to 1350 m and from 400 to 2500 m.

Davallia solida (Forst.) Sw. in J. Bot. (Schrader) 1800. 87. 1801; Ogata, Icon. Fil. Jap. **2**. pl. 65. 1929; DeVol & Yang in Li *et al.*, Fl. Taiwan **1**: 273, pl. 96. 1975; Tagawa & Iwatsuki, Fl. Thailand **3** (2): 163. 1985; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. **14**: 226. 1989; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. **1**: 190, pl. 76. 1994; Noot. in Blumea **39**: 202. 1994. — *Trichomanes solidum* Forst., Fl. Ins. Austr.

86. 1786. — *Humata solida* Desv., Prod. Fam. Foug. 324. 1827 — *Stenolobus solidus* K. Presl, Tent. Pterid. 130. 1836. (Type; Forster 308 (BM, sio; P), Pacific Is.)

Stenolobus ornatus K. Presl. Tent. Pterid. 130. 1836. — [*Davallia ornata*, nomen Wall., Cat. 246. 1828.] — *Davallia solida* var. *latifolia* Hook., Sp. Fil. 163, t. 42B. 1846. — *Davallia solida* var. *ornata* Mett. ex Kuhn in Ann. Mus. Bot. Lugd.-Bat. 4: 286. 1869; Wu *et al.* in Bull. Dept. Biol. Sun Yatsen Univ. 3: 106, pl. 44. 1932. (Type; Wallich 246 (K, iso; P), Malaya, Penang.)

Davallia solida var. *sinensis* Christ in Bull. Herb. Boissier 7: 18. 1899; Tard.-Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine 7: 104. 1939. — *Davallia sinensis* Ching in Bull. Fan Mém. Inst. Biol. 2: 202, t. 16. 1931; Fl. Reip. Pop. Sin. 2: 304. 1959. (Type; Henry 11822 (K, P), China, Yunnan, Mengzi.)

Davallia subsolida Ching, Fl. Reip. Pop. Sin. 2: 376. 1959. (Type; Kudo & Susuki 15996 (PE), Taiwan.)

In China only var. *solida*.

Distribution Sri Lanka, India (Assam, Khasia), Andaman Is., Nicobar Is., Burma, Thailand, Cambodia, China (Yunan, Guangxi, Taiwan), Vietnam (Tonkin), Cochinchina, Malesia; Pacific; common from the Bismarck Archipelago to the Santa Cruz Is., Samoa and the Society Is. and to the New Hebrides, New Caledonia, Fiji, and Tonga.

Ecology Epiphytic, epilithic on different kinds of rock, or terrestrial on different kinds of soil; as well in exposed places as in deep shadow, from open rocky places and savannahs to primary rainforest. Altitude 0~1500 m.

Note Sometimes the leaf segments are very narrow and the plant resembles var. *fejeensis*. This is a widespread species which generally is easily recognisable by the black rhizome which bears hairy scales that soon fall off leaving only the bases.

Davallia trichomanoides Blume, Enum. Pl. Javae 238. 1828; Hook., Sec. Cent. Ferns t. 64. 1861; Tagawa & Iwatsuki, Fl. Thailand 3(2): 162. 1985, p. p.; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. 14: 229. 1989; Noot. in Blumea 39: 206. 1994. (Type; Blume (L908332-946), Java)

Davallia bullata [Wall. Cat. nr. 258. 1828.] ex Hook., Sp. Fil. 169, t. 50B. 1845; Bedd., Ferns S. India t. 17. 1863; Hook., Syn. Fil. 97. 1868; C. B. Clarke, Rev. Ferns N. India 445. 1880; Bedd. Handb. Ferns Brit. Ind. 61. 1883; Hayata in Bot. Mag. (Tokyo) 23: 26. 1909. (Type; Wallich 258 (K, iso; P), Nepal.)

Davallia mariesii Moore ex Baker in Ann. Bot. (London) 5: 201. 1891; Ching in Sinensia 3: 340. 1931; Icon. Fil. Sin. 3: pl. 103. 1935; Fl. Reip. Pop. Sin. 2: 300, pl. 24: 4~6. 1959; Ogata, Icon. Fil. Jap. 6: pl. 261. 1935; Tagawa, Ill. Jap. Pterid. pl. 21, f. 122. 1959; K. H. Shing in Icon. Corm. Sin. 1: 144, f. 287. 1972; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 273. 1975; Jiangsu Zhiwu Zhi (Fl. Jiangsu) 1: 26, f. 28. 1977; Shandong Zhiwu Zhi (Fl. Shandong) 1: 134, f. 70. 1992; C. F. Zhang, Fl.

Zhejiang 1: 294, 1993; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. 1: 188, pl. 75. 1994. (Type: Maries in Hort. Veitch 1818 (Moore herb. in K))

Davallia stenolepis Hayata, Icon. pl. Formos. 4: 204, f. 138. 1914. — *Davallia mariesii* var. *stenolepis* Hoshiz. in Bailey 21: 27, t. 15. 1981. (Type: Mori 2359 (TI), Taiwan, Taito.)

Davallia petelottii Tard.-Blot & C. Chr. in Notul. Syst. (Paris) 6: 4, t. 1 (5~7). 1937; in Lecomte, Fl. Gen. Indo-Chine 7: 104, f. 12: 5~7. 1939; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 161, f. 12: 3. 1985. (Type: Petelot 4200 (P, iso: BM), Vietnam, Tonkin.)

Trogostolon yunnanensis Ching, Fl. Reip. Pop. Sin. 2: 284, 374. 1959; (Type: R. N. 8126 (PE), Yunnan, Binchuan, Jizushan.)

Davallia cylindrica Ching, Fl. Reip. Pop. Sin. 2: 375. 1959. (Type: C. W. Wang 74303 (PE, iso: IBSC), Yunnan, Menghai)

In China only var. *trichomanoides*.

Distribution Continental Asia: India (Kerala, Darjeeling, Assam and eastern Himalayas), Nepal, Sikkim, Burma, N & Central Thailand, China (Shandong, Jiangsu, Fujian, Taiwan, Yunnan), Korea, Japan (common from Ryukyu in the south to Honshu in the north), Vietnam (Annam, Lang Bian, Tonkin), Malesia.

Ecology Epiphytic and epilithic on different kinds of rock, mostly in wet places, sometimes on dry, exposed, places. Altitude 100~3500 m.

Note According to Hoshizaki (oral communication), several of the species treated here as synonyms behave as good species in culture. And, as I have seen in our botanical garden, they do indeed. However, after studying over 400 different collections of the entire area, I could not but conclude that they all belong to one species. That does not exclude, of course, that different forms from different localities intergrade in nature but behave different in culture. It would be best to give these forms cultivar names ('mariesii' and 'stenolepis'). As soon as a plant is cultivated and vegetatively propagated, it forms a clone of similar plants that can be recognised from other clones of the same species. Formally naming the forms according to the rules of nomenclature means that quite a lot of collections can not be named. As the spores of all the forms are also extremely similar, I have no doubt as to their conspecificity.

3.2 Leucostegia

Leucostegia K. Presl, Tent. Pterid. 94, pl. 4, f. 11. 1836; Noot. in Blumea 37: 184. 1992. (Type: *L. immersa*.)

Rhizome bearing scales and hairs or only scales. Roots borne on all sides of rhizome. Scales glabrous or bearing multiseptate hairs, basifixed, base not cordate. Stipes articulated at the base to phyllopodia, grooved or not, glabrous. Lamina compound, tripinnate or quadripinnate (rarely in small plants bipinnate) towards base and in the middle part, deltoid

and broadest towards base, glabrous (sometimes minute hairs present), not or slightly dimorphous (often fertile leaves more strongly dissected). Pinnae deltoid or narrowly triangular. Pinnules of at least the larger pinnae anadromous. Pinnules or pinnalobes narrowly ovate. Rachis adaxially side grooved. Leaf axes glabrous (sometimes a few minute hairs present). Veins in ultimate lobes simple, not reaching the margin. False veins not present. Sori indusiate, frequently single on a segment, terminal on the veins. Indusium scale-like, either attached at the narrow, cordate base only, or attached at the base and only part of the sides.

Distribution Two species, from China throughout SE Asia and Malesia. In the Pacific to Tahiti and the Carolines. Only one species in China.

Leucostegia immersa Presl, Tent. Pterid. 95, t. 4f. 11. 1836; Ching, Icon. Fil. sin. 4: pl. 186. 1937; Fl. Reip. Pop. Sin. 2: 296, pl. 26: 1~3. 1959; Holttum in Gard. Bull. Straits Settlement. 9: 131. 1937; Rev. Fl. Malaya 2nd ed. 352. 1966; Tard. - Blot & C. Chr. in Lecomte, Fl. Gen. Indo-Chine 7: 113. 1939; K. H. Shing in Icon. Corm. Sin. 1: 143, f. 286. 1972; DeVol & Yang in Li *et al.*, Fl. Taiwan 1: 279, pl. 98. 1975; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 286, f. 69: 3~4. 1983; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 169, f. 12: 5. 1985; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. 14: 220. 1989; Noot. in Blumea 37: 185. 1992; X. Cheng in W. T. Wang *et al.*, Vascul. Fl. Hengduan Mount. 1: 154. 1993; W. C. Shieh *et al.*, Fl. Taiwan 2nd ed. 1: 197, pl. 80. 1994. — *Davallia immersa* (Wall., Cat. 256. 1928, nom. nud.) ex Hook., Sp. Fil. 156. 1846; Ogata, Icon. Fil. Jap. 8: pl. 369. 1940. (Type: Wallich 256 (K, L, P), Nepal.)

Humata dryopteridifrons Hayata, Icon. Pl. Formos. 6: 159. 1916 — *Davallia dryopteridifrons* Hayata, l. c. (Type: Faurie 615 (TI, iso; L, P), Taiwan, Arisan.)

Distribution India, Sikkim, Butan, Burma, Thailand, Indo-China, Cambodia, China (Taiwan, Guangxi, Yunnan, Xizang). Throughout Malesia.

Ecology Epiphytic and terrestrial. Altitude 1000~2800 m.

3.3 *Gymnogrammitis*

Gymnogrammitis Griffith in Not. Pl. Asiat. 2: 608. 1849; Icon. Pl. Asiat. 2: pl. 129, f. 1. 1849; Ching in Sunyatsenia 5: 220. 1940; Fl. Reip. Pop. Sin. 2: 284. 1959; Acta Phytotax. Sin. 11: 13. 1966; Acta Phytotax. Sin 16: 16. 1978; Kato in J. Fac. Sci. Univ. Tokyo sect. 3 Bot. 13: 565. 1985; Noot. in Blumea 37: 186. 1992. — *Gymnogrammitidaceae* Ching in Acta Phytotax. Sin. 11: 13. 1966. (Type: *Polypodium dareiforme* Hook.)

Rhizome bearing only scales. Roots restricted to the ventral side of lateral buds (sometimes borne all over the ventral side); scales light brown, without pale border, not hairy but with marginal setae at least in distal part, not toothed, smooth on the adaxial surface, basifixed with cordate base and much overlapping basal lobes. Stipes articulated to phyllopodia,

grooved, glabrous or with few scales. Lamina compound, tripinnate or quadripinnate towards base and in the middle part, towards base deltoid and broadest or elongate, often narrowed, glabrous. Lamina not dimorphous. Pinnae linear-triangular. Pinnules of at least the larger pinnae anadromous. Pinnules or pinnalobes linear-oblong. Ultimate segments or lobes obtuse or acute without a pronounced tooth. Rachis adaxially grooved. Leaf axes glabrous. Veins in ultimate lobes simple, not reaching the margin. False veins not present. Sori exindusiate, frequently single on a segment, facing midveins at the bending point.

Gymnogrammitis dareaeformis (Hook.) Ching ex Tard-Blot & C. Chr. in Notul. Syst. (Paris) 6: 2. 1937; in Lecomte, Fl. Gen. Indo-Chine 7: 117, f. 14: 1~2. 1939; Ching, Fl. Reip. Pop. Sin. 2: 284. 1959; Ching *et al.* in Chun, Fl. Hainan. 1: 62, f. 29. 1964; Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 289. 1983; K. H. Shing in Icon. Corm. Sin. 1: 146, f. 292. 1972; Noot. in Blumea 37: 187. 1992; X. Cheng in W. T. Wang *et al.*, Vascul. Pl. Hengduan Mount. 1: 157. 1993. — *Polypodium dareaeforme* Hook., Sec. Cent. Ferns t. XXIV. 1860; Baker in Hook. & Baker, Syn. Fil. 339. 1867 — *Leucostegia dareaeformis* Bedd., Suppl. Ferns Brit. India 4. 1876 — *Davallia dareaeformis* Levinge ex C. B. Clarke in Trans. Linn. Soc. London I Bot. 1: 443, 1880, p. p. — *Araistegia dareaeformis* Copel. in Univ. Calif. Publ. Bot. 12: 398. 1931; Tagawa & Iwatsuki, Fl. Thailand 3 (2): 151, f. 11: 1. 1985. (Type: Simons 98 (K), Khasya Hill.)

Polypodium dareaeformioides Ching in Sinensia 1: 12. 1929; Icon. Fil. Sin. 1: pl. 41. 1930. (Type: R. C. Ching 6054 (non vidi), Guangxi, Luocheng.)

Distribution India (W Bengal, Assam, Khasi Hills, Nagaland) Nepal, Bhutan, Sikkim, Burma (Chin Hills), Thailand, China (Hunan, Guizhou, Guangxi, Yunnan, Hainan).

Ecology Epiphytic on mossy tree trunks or epilithic in evergreen forests. Altitude 1200~2600 m.

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